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**The Equity Premium Puzzle,
Ambiguity Aversion, and
Institutional Quality**

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1. The Equity Premium Puzzle

- **The equity premium puzzle (EPP)** is the differential between return to equity and return to safe assets in excess of the premium that can be explained on the basis of a reasonable degree of risk aversion.
- **Equity Premium (EQP)** = Equity (stock) Return (**risky asset**) – Bond Return (**safe asset**)
- **Stock Return: More volatile; Bond Return Less volatile.** Risk averse investor demands a **risk premium** on the return on the more volatile asset.
- But, under **expected utility theory**, the observed EQP is deemed “**too**” **high** to be explained by the relative volatility of the assets and risk aversion. Mehra and Prescott (1985); Mehra (2003).
- In order to explain the observed high EQP, **the degree of risk aversion needs to be excessively high**; this is not supported empirically.

2. Contributions of the Paper

EPP is posited in the theoretical context of expected utility theory. There is a wide body of literature on this puzzle.

This paper makes two main contributions:

- 1. Is EPP a global phenomenon?**
Does it prevail in both the mature and emerging markets?
We look at **29 emerging** and **24 mature markets**.
- 2. Can we explain EPP on the basis of ambiguity aversion, in addition to risk aversion?**

The paper finds that **the answer to both questions is yes.**

3. Data and Measurement

Real EQP = Real Stock Market Return – Real Safe Asset Return

- **Real Stock Market Return** is calculated as the yearly percentage change in the stock market index that is obtained by dividing the nominal stock market index by the CPI index.
- **Real Safe Asset Return** is calculated as the nominal return minus CPI inflation. Choice of safe assets is explained in the appendix. Typically, **treasury bills or government bonds are chosen as safe assets.**
- **Dividend yield is excluded** due to lack of reliable data. **Including dividend yield, EQP could be significantly higher.**
- **The overall period under consideration is 1996–05, which is a relatively short period.** It is chosen on the basis of data availability in most emerging markets, where stock markets have become more active and have grown significantly only within the last decade. Also, the World Bank institutional quality indexes and most other indexes used are available only for this period. **However, a ten-year period is long enough to facilitate robust inferences** because it allows for market adjustments that distinguish longer-term market trends from temporary fluctuations in asset returns.³

4. Equity Premium Is A Global Phenomenon

Table 1. Average Equity Premium, Stock Market and Safe Asset Return in the Sample Countries, 1996–00, 2001–05, 1996–05¹

	1996-2000	2001-2005	1996-2005
	Real Values in Percent		
All Sample Countries (53)			
Equity premium	6.2	11.9	9.1
σ_s (sample)	16.3	17.2	8.2
σ_p (period)	17.7	19.5	18.8
Stock market return	10.7	14.3	12.5
σ_s (sample)	15.9	16.9	8.4
σ_p (period)	12.5	18.7	18.3
Safe asset return	4.3	2.4	3.4
σ_s (sample)	3.7	2.5	2.8
σ_p (period)	0.4	0.9	1.2
Emerging Markets (29)			
Equity premium	0.0	20.5	10.5
σ_s (sample)	16.6	18.6	10.0
σ_p (period)	22.5	19.2	23.2
Stock market return	5.6	23.1	14.4
σ_s (sample)	16.7	17.7	10.0
σ_p (period)	22.3	18.0	22.0
Safe asset return	5.1	2.6	3.9
σ_s (sample)	4.4	3.3	3.5
σ_p (period)	0.8	1.4	1.7
Mature markets (24)			
Equity premium	13.6	1.5	7.5
σ_s (sample)	12.2	6.4	4.7
σ_p (period)	14.3	20.4	18.6
Stock market return	16.9	3.7	10.3
σ_s (sample)	12.4	6.6	5.0
σ_p (period)	14.5	20.1	18.7
Safe asset return	3.3	2.2	2.7
σ_s (sample)	2.3	0.9	1.4
σ_p (period)	0.3	0.3	0.6

Source: Authors' estimates; Appendix I.

¹ Period averages are calculated as the sample average of individual country averages for each period; σ is standard deviation. Because of missing data during 1996-97 for some emerging market countries, the period averages in this table slightly differ from those that can be calculated from Table 2, and equity premium may not exactly equal to the difference between stock market return and safe asset return in 1996-2000.

Chart 1. Equity Premium, Stock Market and Safe Asset Return in the Sample Countries, 1996–05

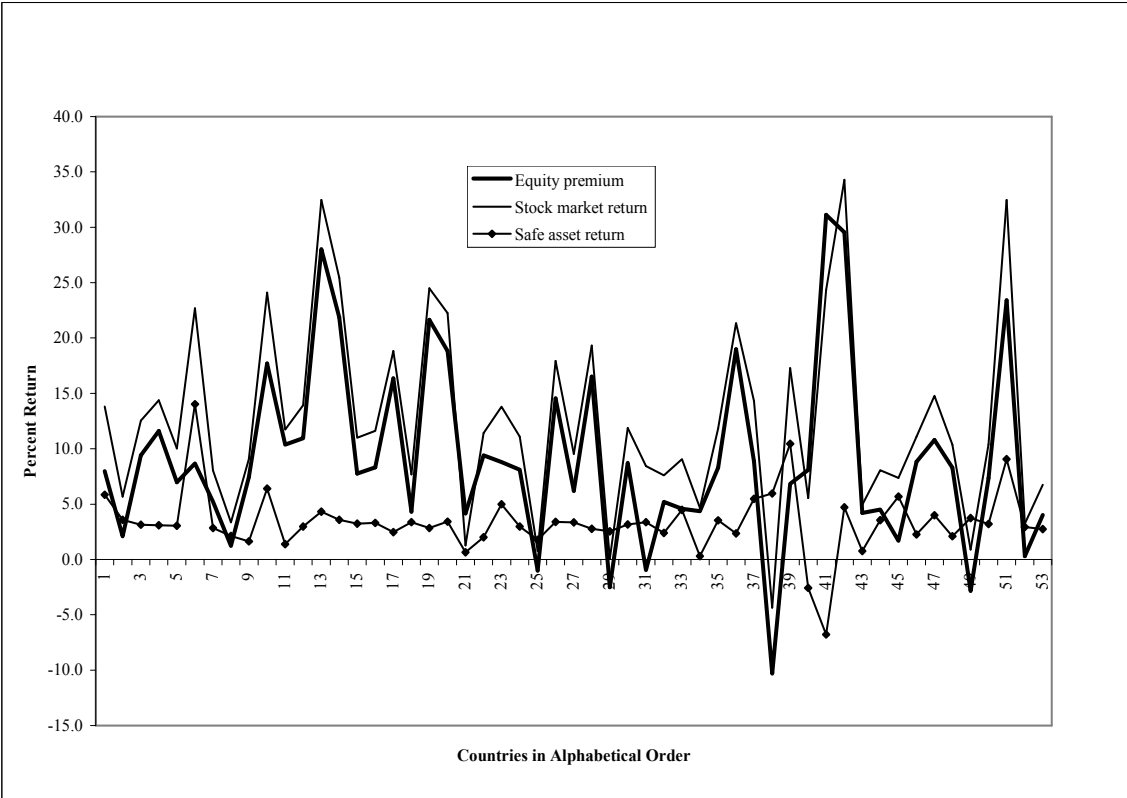
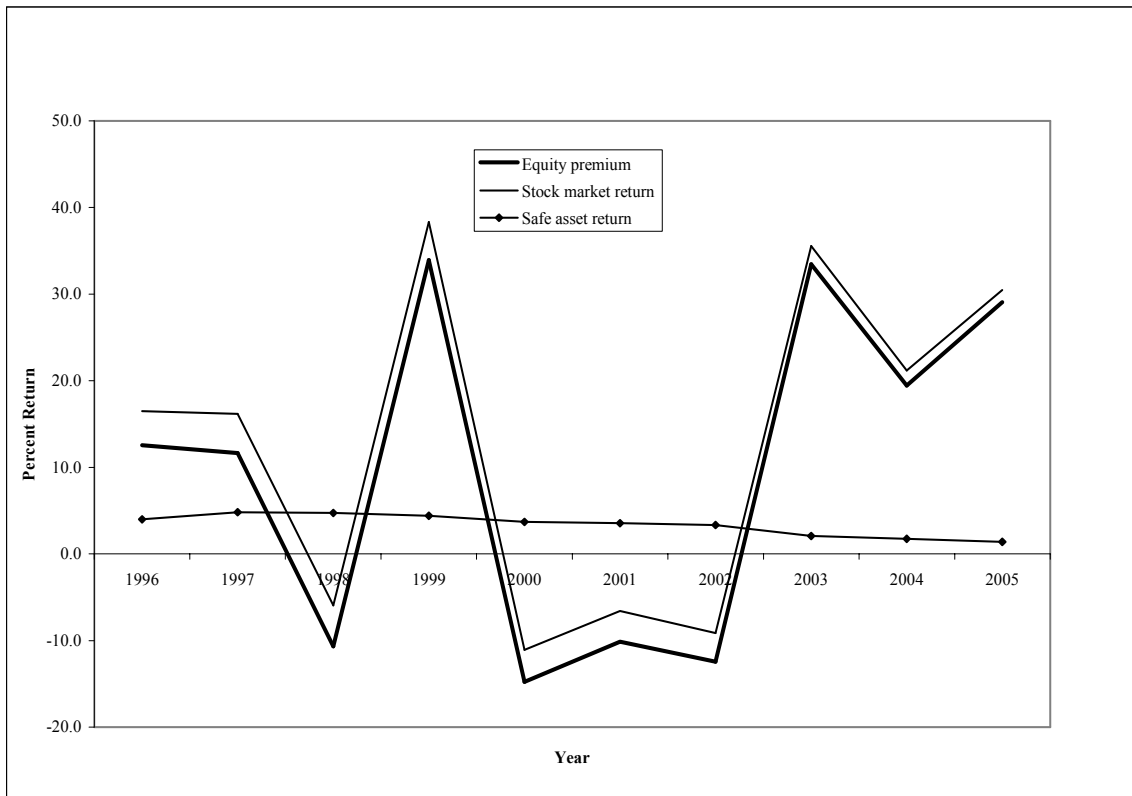


Chart 2. Average Equity Premium, Stock Market and Safe Asset Return, Yearly Country Sample Averages, 1996–05



Sources: Table 2; Country specific data available from the authors.

Observations from data:

- 1. Large equity premium both in emerging and mature markets,** comparable to previous literature (data mostly from mature markets). So, we may argue that **the observed equity premia are “too” large** under expected utility theory.
- 2. Stock returns are more volatile than safe asset returns:** This justifies risk premium and its impact on equity premium under risk aversion.
- 3. Equity premium is higher in emerging markets. Why?**
- 4. Main determinant of equity premium is stock return.**

5. Risk Aversion and Ambiguity Aversion

- **Knightian uncertainty, or ambiguity, implies that the probabilities and payoffs associated with most investments are not known with precision.**
- **Ellsberg's two-color problem:** There are two urns, both contain a total of 100 black and red balls.
- **Urn 1:** Contains exactly 50 red and 50 black balls. You bet on a color of your choice. If you draw a ball with that color, you win \$100; otherwise you lose nothing.
- **Urn 2:** The proportion of red and black balls may vary from 0 to 100, that is, it is possible to have:
 $(0B, 100R); (1B, 99R); (2B, 98R); \dots; (99B, 1R); (100B, 0R).$
- You bet on a color of your choice. If you draw a ball with that color, you win \$100; otherwise you lose nothing.

Questions:

1. Which urn would you prefer to draw from, Urn 1 or Urn 2?
2. If you would prefer to draw from Urn 1 (risky), then how high a prize money would you want, for you to prefer to draw from Urn 2 (ambiguous)?

Observations:

1. **Most people prefer Urn 1 (risky) to Urn 2 (ambiguous).** Most people exhibit **ambiguity aversion**.
2. If you want a **premium** to choose Urn 2 (ambiguous) to Urn 1 (risky), e.g., if you would prefer to draw from Urn 2 if the prize were \$120, instead of from Urn 1 with the prize of \$100, then the **difference is the ambiguity premium**.

Say, your investment is \$80. Then, the return on the risky asset is $(\$100/\$80 - 1) = 25\%$; the return on the ambiguous asset needs to be $(\$120/\$80 - 1) = 50\%$.

In the investor portfolio, for the risk and ambiguity averse investor to be indifferent between risky and ambiguous assets, **ambiguous asset needs to pay a risk premium plus an ambiguity premium**.

- We observe an equity premium but we do not observe risk and ambiguity premium separately. However, **conceptually, the separation in percentages is**

$$\frac{A-C}{Y} = \frac{A-R}{Y} + \frac{R-C}{Y},$$

- Y = Investment (\$)
- C = Return on safe asset (\$)
- R = Return on risky asset (\$)
- A = Return on ambiguous asset. (\$)

- From data, we observe $(A-C)/Y$. Since expected utility theory does not differentiate between risk and uncertainty, in the expected utility theory framework, the observed return differential $(A-C)/Y$ is attributed to only to risk premium but, for risk premium, expected utility theory predicts $(R-C)/Y$. In the literature based on expected utility theory, the differential $(A-C)/Y$ is deemed too large relative to $(R-C)/Y$ to be explained by a justifiable degree of risk aversion, and hence the equity premium puzzle.

- However, if we take into account ambiguity aversion, the observed return differential may not be too large for empirically supportable degrees of ambiguity and risk aversion.

- **A Possible Model of Ambiguity Aversion:** We can use **cumulative prospect theory** with **empirically supported risk aversion and probability weighting parameters** and simulate the results in Table 5.

$U(X) = X^\theta$, $0 < \theta < 1$, where θ is the **constant relative risk aversion parameter**;

$U'(X) > 0$; and $U''(X) < 0$, i.e., the **decision maker is risk averse**.

Safe asset return: C (given);

Risky asset return: $R = U^{-1}\left(\frac{U(C)}{w(p)}\right) \geq C$;

Ambiguous asset return: $A = U^{-1}\left(\frac{w(p)}{w(q)w(z)}U(R)\right) \geq R$;

For $U(A) = U(R) = U(C)$;

With $p = q.z$; $w(p) \geq w(q)w(z)$;

Then $A \geq R \geq C$;

An empirically supported specification for subjective probability weighting, $w(\cdot)$, is

$$w(p) = \frac{p^\alpha}{[p^\alpha + (1-p)^\alpha]^{1/\alpha}}, 0 < \alpha < 1,$$

where α is the subjective probability weighting parameter.

**Table 5. Simulations for Equity Premium
(in percent)**

	EUT		CPT					Return on Safe asset <i>C/Y</i>
	Equity premium <i>(R-C)/Y</i>	Return on risky asset <i>R/Y</i>	Equity premium <i>(A-C)/Y</i>	Ambiguity premium <i>(A-R)/Y</i>	Risk premium <i>(R-C)/Y</i>	Return on Ambg. Asset <i>A/Y</i>	Return on risky asset <i>R/Y</i>	
Risk aversion parameter, $\theta = 0.50$								
α								
0.550	2.1	4.1	15.4	8.8	6.5	17.4	8.5	2.0
0.575	2.1	4.1	12.6	6.8	5.8	14.6	7.8	2.0
0.600	2.1	4.1	10.6	5.3	5.2	12.6	7.2	2.0
0.625	2.1	4.1	8.9	4.2	4.7	10.9	6.7	2.0
0.650	2.1	4.1	7.7	3.4	4.3	9.7	6.3	2.0
0.675	2.1	4.1	6.7	2.7	4.0	8.7	6.0	2.0
0.700	2.1	4.1	5.8	2.2	3.7	7.8	5.7	2.0
Subjective probability weighting parameter, $\alpha = 0.65$								
θ								
0.300	4.6	6.6	25.7	14.1	11.6	27.7	13.6	2.0
0.400	2.9	4.9	12.3	5.9	6.4	14.3	8.4	2.0
0.500	2.1	4.1	7.7	3.4	4.3	9.7	6.3	2.0
0.600	1.6	3.6	5.4	2.2	3.2	7.4	5.2	2.0
0.700	1.3	3.3	4.2	1.6	2.6	6.2	4.6	2.0
0.800	1.1	3.1	3.4	1.3	2.1	5.4	4.1	2.0
0.900	1.0	3.0	2.8	1.0	1.8	4.8	3.8	2.0
Probability values: $p = 0.70$ $q = 0.85$ $z = 0.82$ $p = qz$								

Source: Authors' simulations.

- For small variations in those parameters, we obtain **large equity premia in ambiguity, much greater than what we can generate in uncertainty.**

6. Discussion: The Role of Institutions in the Degree of Ambiguity

- **Ambiguity is modeled as a compound lottery that is not reducible to a simple lottery** ($p = qz$ under expected utility theory but $w(p) \geq w(q)w(z)$ under cumulative prospect theory).
- **In ambiguity, there are more events leading to the same outcome**, Event I occurs with probability q ; Event II occurs with probability z . But **with simple risk, only a single event occurs with probability p** . And, $p = qz$, for comparison. In ambiguity, there are more layers of uncertainty. **If we imagine Event I and Event II occurring over time, it is easy to see the difficulty of predicting probabilities and payoffs with precision.**
- **Bond (safe asset) cash flows are known with certainty, while corporate cash flows and earnings are difficult to predict.** Profitability of a corporation depends on more layers of information flows and decisions (events) than the return on bonds. The additional layers of uncertainty, especially over time, underline the impossibility for even a specialized investor of predicting all possible events—some unknown, some unknowable—and their impact on equity return with precision.

- **Summers (1993) underlines that market prices do not necessarily reflect only rational assessments of the fundamentals. Schiller (1993) concurs that stock prices are highly ambiguous;** in addition to fundamentals, stock price movements may reflect unquantifiable factors such as suggestibility and group pressure, diffusion of opinions, social movements, and even fashions and fads.
- Corporate fortunes exhibit the type of uncertainty examined by **Frank Knight in his *Risk, Uncertainty and Profit* (1921, 2002)**. Broadly, **Knight's main argument is that return to investment is return to uncertainty rather than quantifiable (therefore, diversifiable) risk; so is return to equity**, reflecting varying degrees of uncertainty. Safe assets, mainly government bonds, however, have fewer layers of uncertainty and are generally subject to fewer number of possible events that lead to their final payoff.
- **It is possible to extend this insight to the behavior of equity premium across countries that exhibit varying degrees of uncertainty in the Knightian sense.** In addition to generally quantifiable risks associated with observable economic fundamentals, **such uncertainty reflects institutional quality.**

- **The fundamentals that can be quantified** with a reasonable degree of precision include growth, capital market development, debt level, inflation, and so on.
- **The factors that are more difficult to quantify** include policymakers' track record and the credibility of their commitment to robust macroeconomic management and policies, as well as effectiveness of government policies.
- **Institutional factors play an important role in maintaining policy commitments and effective implementation, and a stronger institutional environment makes commitments more credible.** Institutional strength also plays an important role in determining the quality of litigation and settlement of business disputes, quality of taxation and expenditure, regulation, investor protection, enforcement of property rights and protections against expropriation by the state, and the integrity of available economic data.
- **Control of corruption and regulatory quality** reflect on corporate costs, as well as on the quality of **corporate governance**. Similarly, the extent of **political stability** and **rule of law** have an impact on many unquantifiable and subjectively evaluated business risks.

- **Those factors, evaluated on a subjective basis by respondents from different countries, are embedded in the World Bank institutional quality (and other) indexes, which have significant and intuitively appealing effects on investor decisions and profitability.**
- **Greater uncertainty emanating from institutional weaknesses may have a significant impact on economic outcomes, including asset returns.**
- In this vein, Stulz (2005) argues that the “**twin agency problem**” is important in explaining why country-specific attributes can outweigh the fundamentals in the determination of financial flows and rates of return. For example, limited capital flows to developing countries despite higher returns on investment and lower trade barriers (Lucas paradox); home equity bias. **The twin agency problem refers to corporate insider discretion and state ruler (government) discretion in expropriating rents from investors, which can deter investment and wide stock market participation, and result in higher equity returns.**
- Closely in line with the theme of this symposium, **Stulz’s paper title is “The Limits of Financial Globalization,”** *Journal of Finance* 60(4), 1595–1638.

- **The twin agency problem emanating from institutional weaknesses is directly connected to ambiguity.** As underlined in the literature, **institutions have two fundamental effects:**
 1. They **provide the right (or wrong) incentives to invest** (e.g., protection against expropriation by the twin agents) (North, 1991, 1994).
 2. They **reduce (or increase) ambiguity over space and time by excluding some outcomes or events** (e.g., discretionary rent-seeking by the twin agents through corruption) (Erbaş, 2004). **The second effect indicates a negative correlation between the degree of ambiguity and institutional strength.**

- **If investor protection is low, small investors may be less willing to hold shares.** This implies that, **if the relative size of small investors is large in an economy, lack of wide participation in the stock market may push equity returns up and safe asset returns down, and thus result in a high equity premium.** (La Porta and others, 1998).

- Guiso and others (2005) define **trust as the subjective probability of being cheated by equity issuers** (corporate boards and managers), **as well as by the institutions that facilitate and regulate stock market participation** (brokerage houses, hedge funds, regulatory and supervisory bodies). **Low trust can result in high equity premium because low trust tends to lower investment in equity, thereby increasing equity return, and, low trust tends to increase investment in safe assets, thereby decreasing safe asset return.**
- **Source dependence:** Investor trust in the actions of more knowledgeable decision makers (corporate insiders; rating agencies), and their trust in the institutional checks and balances (government insiders) on such actions can play an important role in the determination of the extent of stock market participation and equity premium.
- **Comparative ignorance:** **Ambiguity aversion is driven by the comparison of prospects. In the case of equity premium, ambiguity aversion emanates from the comparison of stock and safe asset returns. The same comparison is relevant between emerging markets and mature markets for both stocks and bonds.** It is possible, therefore, that ambiguity aversion, emanating from market comparisons of stocks to bonds and comparisons of emerging markets to mature markets, plays a significant role in the determination of equity premium. In the comparison of prospects in emerging and mature markets, perceptions of relative institutional strength can be particularly important.

- As noted, when the time dimension is considered, ambiguity is placed in a more realistic context. **Over time, institutions play an important role in reducing uncertainty by establishing rules for dealing with events that can be anticipated with varying degrees of precision and events that cannot be foreseen** (North, 1994). Knight (2002) stresses that basic market institutions evolve to deal with uncertainty. **Strong institutions make future policy responses to unforeseen events more easily predictable or less ambiguous, which may also reflect on the degree of volatility.**
- Hale and others (2006) present evidence that institutional quality (better shareholder and creditor rights) lowers the probability of financial crises; higher probability of crises increases stock market volatility; and, deeper markets are less volatile than thinner markets. Those authors conclude that **institutional weaknesses increase the variance of stock returns, which may contribute to the spread between stock and safe asset returns; thus, institutional factors may have significant explanatory power in deconstructing EPP.**
- **We use the World Bank institutional quality (and other) indexes.** Other indexes include: Heritage Indexes of Economic Freedom; Transparency International; International Country Risk Guide; Global Competitiveness Index; World Bank Enterprise Surveys; World Bank Doing Business Index; World Values Survey Confidence Index.

7. Correlation Tests and Regressions

- **Fundamentals:**
- 1. **Real Growth Rate** (alternatively, real per capita income growth rate);
- 2. **Equity market capitalization:** Outstanding stock value divided by GDP; proxy for financial market development and depth, along with bond market capitalization;
- 3. **Bond market capitalization:** Outstanding bond value divided by GDP;
- 4. **Credit to private sector** in percent of GDP; used as a proxy both for liquidity availability to investors and financial market development; it can also be interpreted as an indicator of the degree of confidence and transparency in the financial system, reflecting better lender protection, greater availability of reliable credit information, and better enforcement of laws.
- 5. **Lagged (private) consumption:** $(C_t/Y_t - C_{t-1}/Y_{t-1})$; used as a proxy for the degree of consumption volatility; if financial instruments that can be used for consumption smoothing are accessible by a greater segment of the population, then consumption volatility is likely to be lower.

- **Unanticipated (CPI) inflation:** $\pi_t - \pi_{t-1}$; to the extent investors are wrong in their inflation expectations, actual returns are high when unanticipated inflation is low, and returns are low when unanticipated inflation is high.
- 7. **Tax ratio:** Corporate income tax rate divided by personal income tax rate; a higher corporate tax burden tends to increase gross stock return in order to make the net stock return attractive relative to bond return that is subject to a lower tax burden.
- 8. **Age composition:** Percent of population above forty; an older population—with higher and more stable income and smaller liquidity constraints that are compatible with more established jobs—is likely to have a higher share of equity income. Thus, for an older population, equity income volatility has a larger impact on total income volatility, therefore, a higher stock return is necessary to cover for higher volatility. It can be expected that, if the share of older cohorts is large in total population, then stock return and equity premium are likely to be high.

- **Proxies for the degree of ambiguity are the WB institutional quality indexes:**
 1. **Overall index** (simple average of 2-7 below);
 2. **Voice and accountability;**
 3. **Political stability;**
 4. **Government effectiveness;**
 5. **Regulatory quality;**
 6. **Rule of law;**
 7. **Control of corruption.**

- **The WB indexes are constructed such that the higher the index value, the higher (better) is institutional quality rating.**

- **Priors concerning ambiguity proxies:** The foregoing arguments indicate that:
 1. **The correlation between equity return and the degree of ambiguity (institutional quality) is negative**, that is, high ambiguity (low institutional quality) should result in high stock return; low ambiguity (high institutional quality) should result in low stock return.
 2. By the same logic, **the correlation between safe asset return and the degree of ambiguity (institutional quality) is also negative**, that is, high ambiguity should result in high bond return; low ambiguity should result in low bond return.
 3. If the degree of ambiguity affects stock and safe asset returns in the same direction, the impact on equity premium is indeterminate *a priori*. However, **stock return is the main determinant of equity premium, therefore, a negative correlation between the degree of ambiguity (institutional quality) and equity premium may be expected.**

Cross-Correlations:

- We first explore the extent of cross-correlation between the variables by calculating the Pearson Product Moment Correlation Matrix. The null hypothesis is there is no correlation; let r represent the sample correlation coefficient; the relevant t test is

$$t = r / \sqrt{(1 - r^2) / (n - 2)},$$

where n is the number of observations.

Table 7. Summary of Statistically Significant Cross-Correlations between Independent and Dependent Variables (*t* statistics)

	EQP	STR	SAFE	EQP	STR	SAFE	EQP	STR	SAFE
	1996-2000			2001-2005			1996-2005		
<u>Dependent Variables</u>									
Stock return (STR)									
All	25.4			48.9			18.6		
Emerging	15.5			29.5			12.9		
Mature	24.5			40.4			16.2		
Safe asset return (SAFE)									
All								(1.9)	
Mature								(1.9)	
<u>Independent variables</u>									
Real growth rate									
All	2.1	2.2		2.7	2.4				
Emerging	2.3	2.4				-2.7			
Equity market capitalization									
Bond market capitalization									
All	2.4	2.2		-3.8	-3.9				
Emerging						2.5			
Mature						-2.4			
Credit to private sector									
All				-4.4	-4.8		-3.4	-4.1	
Emerging							-2.4	-2.7	
Mature	-2.6	-2.8					-2.8	-3.2	
Lagged consumption									
Mature						2.2			
Unanticipated inflation									
All						-3.1	-3.4	-2.8	
Emerging	-2.1					-2.4	-2.5		
Tax ratio (CIT/PIT)									
All				4.0	3.5	-3.1	2.3		-2.1
Emerging				2.8	2.2	-3.3	2.0		
Age composition									
All	3.4	2.7		-4.2	-4.6				
Mature				-2.1	-2.1				
<i>World Bank Indexes</i>									
Voice and accountability									
All				-4.3	-4.3		-2.0		
Political stability									
All	2.3			-4.3	-4.5			-2.0	
Government effectiveness									
All				-4.9	-5.0		-2.3	-2.3	
Regulatory quality									
All				-4.1	-4.2		-2.1	-2.1	
Rule of law									
All	2.2	2.1		-3.9	-4.0				
Control of corruption									
All	2.7	2.6		-3.7	-3.7				

Source: Authors' estimates.

- **The correlations with the fundamentals are generally as expected:**
 1. **Stock return and equity premium are positively correlated**, i.e., stock return is the main determinant of equity premium;
 2. **EQP is positively correlated with real growth**; greater growth induced by greater investment and greater return to equity;
 3. **EQP is negatively correlated with credit to private sector**; greater availability of liquidity can stimulate greater investment in stocks and result in a decline in stock return; the negative correlation between credit and equity premium and stock return may also indicate less uncertainty in the financial system, which reduces the ambiguity premium and results in lower equity premium;
 4. **EQP is negatively correlated with unanticipated inflation**; this result appears plausible because it indicates that asset returns are vulnerable to the uncertainties surrounding inflation;

5. **EQP is positively correlated with the tax ratio (CIT/PIT)**; a higher corporate tax burden (CIT) tends to increase gross stock return in order to make the net stock return attractive relative to bond return that is subject to a lower tax burden (PIT);
6. **Age composition** shows a positive correlation with equity premium and stock return during 1996–00, however, the correlation turns negative during 2001–05, reflecting mainly the impact of mature markets.

The correlations with the institutional quality indexes are as follows:

- **For the whole sample, the tests show a significantly negative correlation between the World Bank indexes and equity premium during the periods 2001–05 and 1996–05. This result provides strong support to our hypothesis that higher institutional quality reduces ambiguity and results in lower stock return, and hence in lower equity premium.**

B. Regressions

- We propose the following general model: $Y = f(X1, X2, X3, \dots)$, where the dependent variable Y is the vector of values in, respectively, the equity premium, stock returns, or, the safe asset returns sample; $Y = \{y1, y2, \dots, yj\}$, with j denoting a country. As we have argued above, some independent variables may have an impact on equity and safe asset returns in the same direction and, therefore, their impact on equity premium may be ambiguous. Thus, there is merit in regressing equity and safe asset returns on the independent variables separately because this allows us to identify whether equity premium is affected primarily through the equity channel or the safe asset channel. The independent variables $X1, X2, X3, \dots$ are the vectors of the variables shown in Table 5. All variables, including the dependent variables, are normalized as $v_{ij} = (x_{ij} - \mu_i) / \sigma_i$, where x_{ij} is the observation for variable i in country j ; μ_i is the sample mean; and, σ_i is the sample standard deviation for variable i , so that
- $X_i = \{v_{i1}, v_{i2}, \dots, v_{i53}\}$. We run the following regression:
- where u_i is a random error term that is assumed to obey the properties of multiple regression:

$$Y_i = c_0 + \sum_{i=1}^k c_i X_i + u_i ,$$

- where u_i is a random error term that is assumed to obey the properties of multiple regression.
- **Regression results indicate that the fundamentals have significant explanatory power and most World Bank indexes are equally significant.**
- **The regressions results generally confirm our hypothesis: EQP has a negative correlation with voice and accountability; political stability; government effectiveness.** This indicates that the higher those institutional quality indexes (by proxy, the lower the degree of ambiguity), the lower, is EQP.
- **However, EQP is positively correlated with rule of law and control of corruption. Along with reducing uncertainty, institutional quality also has incentive effects (e.g., strong property rights; investor protection).** Thus, higher institutional quality may stimulate larger and longer-term investments with significantly higher returns. So, **while less ambiguity may serve to lower the asset returns, greater incentives to invest may serve to increase equity returns.** Consequently, a **positive correlation between stock return and institutional quality is also quite plausible.**
- **The more general point is that, through the uncertainty and incentive effects, equity premium is significantly correlated with institutional quality, at least, as significantly as it is correlated with the fundamentals. To the extent institutional quality reflects on ambiguity, a strong case can be made for a significant correlation between equity premium and ambiguity**

Table 9. Summary of Statistically Significant Regression Results Including Uncertainty Proxies 1

	EQP	STR	SAFE	EQP	STR	SAFE	EQP	STR	SAFE
	1996-2000			2001-2005			1996-2005		
Real growth rate									
All	0.3								
Emerging	0.4	0.4							
Equity market capitalization									
Mature	0.8	0.8		-1.0	-1.0				
Bond market capitalization									
Emerging							0.4	0.6	
Mature	-0.5								
Credit to private sector									
All	-0.4	-0.5					-0.6	-0.7	-0.4
Emerging							-0.5	-0.5	
Mature		-0.6	-0.7						
Lagged consumption									
All				-0.2	-0.2	-0.2			
Emerging								0.4	
Unanticipated inflation									
All						-0.4			
Emerging						-0.4			
Mature									-1.3
Tax ratio (CIT/PIT)									
All				0.3	0.3	-0.4			-0.4
Emerging				0.5	0.5	-0.4			
Age composition									
All	0.8	0.7				-0.5	0.6		
Emerging							1.0	0.9	
Mature	0.9	0.9							
World Bank indexes									
Voice and accountability									
All	-0.6	-0.6					-0.5		
Emerging	-0.7	-0.5					-0.8	-0.7	
Political stability									
Emerging				-1.0	-1.1		-0.8	-1.1	
Government effectiveness									
All				-1.4	-1.3		-1.1		
Emerging				-1.4	-1.4			-1.0	
Regulatory quality									
Rule of law									
All							1.5	1.2	
Emerging				1.3	1.3		0.9		
Control of corruption									
Emerging									1.3

Source: Authors' estimates; Appendix III Tables 4-6.

¹ Coefficient values. Statistically significant results at least at the 10 percent level are presented. The results that are statistically significant at the five percent level or better are highlighted. The regression sample sizes are the same as those shown in Table 8.

C. Regressions with Other Uncertainty Proxies

- A higher degree of **government intervention** (Heritage) tends to increase EQP.
- Lower **quality of infrastructure** (World Bank Enterprise Surveys) tends to increase EQP.
- Higher **social confidence** (World Values Survey Confidence Index) tends to increase EQP; this may be explained through the incentive effects of institutions.

Conclusions

1. **Equity premium puzzle is a global phenomenon that is present in both emerging and mature markets.**
2. **The impact of the fundamentals on equity premium is mainly through stock return because stock return is the dominant determinant of equity premium.**
3. **Institutional quality indexes play as significant a role as the fundamentals in the determination of equity premium. Equity premium and stock return have a significantly negative correlation with the World Bank indexes for voice and accountability, political stability and government effectiveness.**
4. **Similarly, greater government intervention (Heritage) and less satisfactory infrastructure (World Bank) indicate higher equity premium.**
5. We interpret these results as an indication of institutional quality reflecting on unquantifiable uncertainty or ambiguity. **We argue that lower ambiguity results in a decline in ambiguity premium, therefore, a decline in equity premium.**

6. Interestingly, the results also indicate that **institutional quality indexes are significant in emerging markets but not in mature markets**. On average, mature markets are ranked significantly higher by the World Bank institutional quality indexes; furthermore, the emerging markets sample shows a significantly greater variation (as measured by the sample standard deviation) than the mature markets sample.
7. **These observations lend support to Stulz's (2005) point that "the reason why countries matter is that finance is critically affected by twin agency problems"** (p. 1633). Evidently, institutional quality shows a greater variation in emerging markets, reflecting significantly on perceptions of risk and ambiguity, so that stock returns are significantly affected by the institutional quality ranking of the countries.
8. As Benartzi and Thaler (1995) underline, **"the equity premium is a *puzzle* within the standard expected utility maximizing paradigm"**. The literature has not focused on an important aspect of behavior under uncertainty, namely, **ambiguity aversion**. This paper argues that **ambiguity aversion plays a significant role in the determination of equity premium**. Ambiguity aversion may be instrumental in explaining the observed equity premium, which seems too large under ³⁴ expected utility theory.

- 9. When ambiguity aversion is taken into account, a significant part of the premium can be attributed to unquantifiable uncertainty or ambiguity. The empirical results support our main hypothesis that unquantifiable uncertainty plays an important role in the determination of equity returns. Safe assets, on the other hand, appear to exhibit less ambiguity, and this is the fundamental reason why markets see them as relatively safer than equity.**

- 10. To the extent that institutional quality is a good proxy for the degree of ambiguity in an economy, a strong case can be made that ambiguity aversion significantly augments equity premium and explains a large part of the equity premium puzzle.**

- 11. Thus, through the ambiguity channel, institutions matter in financial globalization. As Stulz suggests, institutional quality may be the main determinant of the limits of financial globalization.**

12. The potential of financial globalization for risk management is better diversifying country-specific and global risks and thus enabling greater global capital flows at lower rates, especially to developing countries. As Frank Knight might have argued, the road to widening the scope of this process will go through improving the global financial architecture to reduce uncertainties and strengthen international and country-specific institutional structures. It appears we still have a long way to go. Where private markets (including insurance), cannot resolve ambiguities at least on a global scale, the IMF will continue to play an obviously vital global role.